

MAG REGIONAL FREEWAY BOTTLENECK STUDY

TASK 3 RANKING PROCESS WORKING PAPER

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Submitted to:
THE MARICOPA ASSOCIATION OF GOVERNMENTS

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RANKING PROCESS WORKING PAPER

The purpose of this working paper is to present the ranking process that will be used in the evaluation of the bottleneck locations. In addition, the bottleneck locations and the Data Collection Plan, which specifies the data needed for the ranking process, are included.

While preparing this working paper, the Project Management Plan was reviewed to ascertain that no significant changes have occurred that would require revisions to the Plan. No changes were required, therefore the Management Plan stands as submitted on July 10 and is not included.

BOTTLENECK LOCATIONS

Bottleneck locations were discussed at both the July 19 and the August 23 Stakeholders Group meetings and also at a meeting with senior ADOT staff on August 16. For purposes of this study, a bottleneck is defined as an operational or geometric condition that creates congestion problems. A “lack of basic lanes” capacity problem is not considered in the bottleneck analysis. Since we are dealing with existing bottlenecks, this study deals only with the existing freeway system.

The identified bottleneck locations are listed in Table 1 and are shown in map form in the data collection section of this working paper.

Table 1: Bottleneck Locations

Route	Location
I-10 Morning Peak	103 rd Avenue to SR-51 TI-EB
I-10 Morning Peak	Chandler Blvd to 40 th Street-NB
I-10 Morning Peak	SR-51 TI to 103 rd Avenue-WB
I-17 Morning Peak	Happy Valley Road to Union Hills Drive-SB
I-17 Morning Peak	Glendale Avenue to Van Buren Street-SB
SR-51 Morning Peak	Northern Avenue to I-10 TI-SB
US-60 Morning Peak	Stapley Drive to I-10 TI-WB
SR-101 Morning Peak	Indian School Road to I-10 TI-SB
SR-101 Morning Peak	Thomas Road to SR-202 TI-SB
SR-101 Morning Peak	Guadalupe Road to McKellips Road-NB
SR-202 Morning Peak	Dobson Road to I-10 TI-WB
I-10 Evening Peak	SR-51 TI to 103 rd Avenue-WB
I-10 Evening Peak	40 th Street to Elliot Road-SB
I-10 Evening Peak	27 th Avenue to SR-51 TI-EB
I-17 Evening Peak	Bell Road to Deer Valley Road-NB
US-60 Evening Peak	I-10 TI to Country Club Road-EB
SR-101 Evening Peak	SR-202 TI to Guadalupe Road-SB
SR-143 Evening Peak	SR-202 TI to I-10 TI-SB
SR-202 Evening Peak	SR-51 TI to Alma School Road-EB

RANKING PROCESS

The ranking process was a discussion item at both the July 19 and the August 23 Stakeholders Group meetings. The proposed methodology for the ranking process task was to identify a number of factors to use in the evaluation and prioritization of bottleneck locations. To complete this process, the ranking factors would first be defined and then weighted by level of importance by the Stakeholders Group. During the bottleneck location evaluation task, values would be determined for each evaluation factor, then weighted based upon the determined weighting, and finally the individual weighted scores for each factor would be added to determine a score for each bottleneck location. The result would be a priority list of bottleneck locations.

At the first Stakeholders Group meeting, it was determined that a prioritized ranking would not be attempted. Rather a matrix, presenting evaluation data for each location, would be developed.

At the August 23 Stakeholders Group meeting, the factors, evaluation options for each factor, and the data source for the data needed were discussed. Based upon this discussion, the factors, evaluation options, and the data source were determined and are presented in Table 2. Further refinement of these factors will be undertaken as the data is evaluated.

Table 2: Ranking Factors and Data Source

Factor	Evaluation Criteria	Data Source(s)
Traffic Volume	Peak hour volume per lane taken on approach to system TI	TRA tube counts ATD Video counts ATD FMS camera counts
Traffic Density	Vehicles/mile/lane	Skycomp aerials
Delay	Delay per mile	FREQ
Crashes	Peak hour crash rate/mile	ADOT accident records system
Duration of Congestion	Time at specific density or worse	Skycomp aerials
Freeway-to-Freeway Back-ups	Vehicles in stopped queue	Skycomp aerials
Off-Ramp back-up onto Mainline lanes	Vehicles in stopped queue	Skycomp aerials
On-Ramp back-up onto Mainline lanes	Vehicles in stopped queue	Skycomp aerials
Commercial Vehicle Use	Percentage of large trucks	TRA tube counts ATD Video counts ATD FMS camera counts
Speed	Average speed	FREQ

Thus, one product of the study will be a matrix of bottleneck locations and evaluation factors. The blank matrix is shown in Appendix A.

DATA COLLECTION PLAN

Data for the bottleneck study will be collected through both aerial photography and ground counts. Each method is discussed below followed by a detailed plan for collecting the data.

Aerial Photography

Skycomp, Inc will conduct the aerial photography data collection beginning the week of September 10th, 2001. [Note: The intent was to complete the data collection flights during the week of September 10. With the events of September 11, the FAA tightly controlled permission to fly resulting in data collection stretching out until a number of weeks.]

Over the course of the aerial survey, Skycomp will fly the entire freeway system for 60 minutes for three consecutive hours during the peak hours of traffic, from 6:00 am to 9:00 am and 3:30 pm to 6:30 pm. Thus, six periods of data in the morning and six periods of data in the evening will be collected for the entire freeway system.

Skycomp will then process the information and calculate the time-space density/Level of Service graphics for each highway. They will examine the underlying photography and document the causes for all bottleneck situations. They will also produce a CD-ROM with a slide show of one typical morning and one typical evening peak hour along with the photographic passes of the freeways.

Ground Counts

Ground counts will be collected through the use of video cameras by ATD Northwest and through the use of ADOT installed loops and through tubes placed by Traffic Research & Analysis (TRA).

Video data will be collected using ADOT's FMS cameras where applicable. For locations that are not covered by FMS cameras, ATD will place mounted cameras in the field to collect the data. Video data will be collected at 20 FMS camera locations and at 16 ATD video locations.

ADOT traffic loops will be used at 17 locations. There are 24 locations where TRA will collect tube counts. During the spring of this year, TRA collected volumes on all diamond interchange ramps in the region. These counts will be used in the analysis.

The Data Collection Plan and the bottleneck locations are shown graphically in Figure 1. Not shown are the system interchange locations where counts will be collected on all ramps. The Data Collection Plan, including system interchange ramp locations, is detailed in Tables 4 through 8. The data contained in each table are:

- Table 3: Mainline Camera Locations
- Table 4: System Interchange Camera Locations
- Table 5: Mainline Tube Site Locations
- Table 6: System Interchange Tube Site Locations
- Table 8: ADOT Loop Mainline Site Locations

Figure 1: Data Collection Plan/Bottleneck Locations
(please see Data collection location map under Task 5: Collect Traffic Data—Ground Counts)

Table 3: Mainline Camera Site Locations

Site #	Fwy	Between	Camera Type	Direction	Data
1	I-10	Ray Rd. and Chandler Blvd.	ATD	Both	TV*
2	I-10	Elliot Rd. and Warner Rd.	ATD	Both	TV, Class*
3	I-10	Broadway Rd. and US-60	ATD	Both	TV by Lane
4	I-10	32 nd St. and 40 th St.	FMS	Both	TV, Class, HOV
5	I-17	16 th St. and 24 th St.	FMS	Both	TV, Class
6	I-17	Buckeye Rd. and 19 th Ave.	FMS	Both	TV
7	I-17	I-10 and Van Buren St.	FMS	Both	TV
8	I-17	Camelback Rd. and Indian School Rd.	FMS	Both	TV, Class, HOV
9	I-17	Northern Ave. and Glendale Ave.	FMS	Both	TV, Class, HOV
10	US-60	Cooper Rd. and Gilbert Rd.	ATD	Both	TV
11	US-60	Country Club Dr. and Mesa Dr.	ATD	Both	TV, Class
12	US-60	I-10 and Priest Rd.	ATD	Both	TV, Class
13	I-10	SR-202 and Van Buren St.	FMS	Both	TV, HOV
14	I-10	7 th St. and 16 th St.	FMS	Both	TV, Class, HOV
15	I-10	19 th Ave. and 7 th Ave.	FMS	Both	TV, HOV
16	I-10	35 th Ave. and 27 th Ave.	FMS	Both	TV, Class, HOV
17	I-10	59 th Ave. and 51 st Ave.	FMS	Both	TV, HOV
18	I-10	83 rd Ave. and 75 th Ave.	FMS	Both	TV, Class, HOV
19	SR-101 (E)	Guadalupe Rd. and Elliot Rd.	ATD	Both	TV
20	SR-101 (E)	Broadway Rd. and Southern Ave.	ATD	Both	TV, Class
21	SR-202	Dobson Rd. and Alma School Rd.	ATD	Both	TV
22	SR-202	32 nd St. and 40 th St.	FMS	Both	TV, Class, HOV
23	SR-51	Thomas Rd. and McDowell Rd.	FMS	Both	TV by Lane

24	SR-51	Colter Rd. and Camelback Rd.	FMS	Both	TV, Class
25	SR-51	Shea Blvd. and Northern Ave (closest)	FMS	Both	TV
26	SR-51	Cactus Rd. and Shea Blvd.	FMS	Both	TV
27	SR-51	Bell Rd and Greenway Rd	FMS	Both	TV
28	SR-101 (E)	SR-202 and University Dr.	ATD	Both	TV
29	SR-101 (E)	McKellips Rd. and SR-202	ATD	Both	TV, Class
30	SR-101 (E)	Indian School Rd. and Thomas Rd.	ATD	Both	TV
31	SR-101 (W)	Indian School Rd. and Thomas Rd.	ATD	Both	TV, Class
32	I-17	Greenway Rd. and Thunderbird Rd.	ATD	Both	TV, Class, HOV
33	I-17	Carefree Hwy and Happy Valley Rd.	ATD	Both	TV, Class
34	SR-202	Center Pkwy. and Scottsdale Rd.	ATD	Both	TV, Class, HOV
35	SR-143	University Dr. and I-10	FMS	Both	TV
36	SR-143	SR-202 and Van Buren St.	FMS	Both	TV

Table 4: System Interchange Camera Locations

Site #	To	From	Camera Type	Direction	Data
37	US-60 on ramp	I-10 SB	ATD	EB ramp	TV
38	I-10 on ramp NB	US-60 WB	ATD	NB ramp	TV
39	I-10 on ramp SB	US-60 WB	ATD	SB ramp	TV
40	US-60 on ramp WB	SR-101 SB	ATD	WB ramp	TV
41A	I-10 on ramp EB	I-17 NB	FMS	EB ramp	TV
41B	I-10 on ramp EB	I-17 SB	FMS	EB ramp	TV
42	I-10 on ramp WB	SR-51 WB	FMS	WB ramp	TV

43A	SR-51	I-10 off ramp EB	FMS	EB ramp	TV
43B	SR-202	I-10 off ramp EB	FMS	EB ramp	TV
44	SR-202 on ramp WB	SR-101 WB	ATD	WB ramp	TV

Table 5: Mainline Tube Site Locations

Site #	Fwy	Between	Direction	Data
45	I-10	Oglesby Rd. and Miller Rd.	Both	TV
46	I-10	East of Miller Rd.	Both	TV
47	I-10	West of Jackrabbit Rd.	Both	TV
48	I-10	Jackrabbit Tr. and Citrus Rd.	Both	TV
49	I-10	Cotton Lane and Estrella Pkwy.	Both	TV
50	I-10	Litchfield Rd. and Dysart Rd.	Both	TV
51	I-10	115 th Ave. and 107 th Ave.	Both	TV
52	I-10	SR-101 and 91 st Ave.	Both	TV
53	SR-101	I-10 and Thomas Rd.	Both	TV
54	SR-101	Camelback Rd. and Glendale Ave.	Both	TV
55	I-17	SR-101 and Deer Valley Dr.	Both	TV
56	SR-101	I-17 and 19 th Ave.	Both	TV
57	I-17	Carefree Hwy. and Pioneer Rd.	Both	TV
58	I-17	Pioneer Rd. and Anthem Way	Both	TV
59	I-17	New River Rd. and Anthem Way	Both	TV
60	SR-101	7 th St. and Cave Creek Rd.	Both	TV
61	SR-101	Cave Creek Rd. and Tatum Blvd.	Both	TV
62	SR-101	Tatum Blvd. and Scottsdale Rd.	Both	TV
63	SR-101	Frank Lloyd Wright Blvd. and Cactus Rd.	Both	TV
64	SR-101	Shea Blvd. and Via De Ventura	Both	TV
65	SR-101	Indian Bend Rd. and McDonald Dr.	SB	TV
66	US-60	Val Vista Dr. and Greenfield Rd.	Both	TV
67	US-60	East of Goldfield Rd.	Both	TV
68	I-10	Maricopa Rd. and Queen Creek Rd.	Both	TV
69	I-10	North of Riggs Rd.	Both	TV

Table 6: System Interchange Tube Site Locations

Site #	To	From	Direction	Data
70	I-10 on ramp SB	Baseline Rd.	SB	TV
71	Baseline Rd.	I-10 off ramp NB	NB	TV
72	US-60 on ramp EB	I-10 off ramp NB	NB	TV
73	I-10 on ramp NB	Baseline Rd.	NB	TV
74	US-60 on ramp EB	Baseline Rd.	EB	TV
75	Baseline Rd.	I-10 off ramp SB	SB	TV
76	Broadway Rd.	I-10 off ramp NB	NB	TV
77	I-10 on ramp SB	Broadway Rd.	SB	TV
78	I-10 on ramp WB	Broadway Rd.	WB	TV
79	SR-143 on ramp NB	I-10 off ramp WB	NB	TV
80	I-10 on ramp SB	SR-143 off ramp SB	SB	TV
81	Broadway Rd.	I-10 off ramp SB	SB	TV
82	US-60 on ramp WB	SR-101 off ramp SB	WB	TV
83	SR-101 on ramp SB	US-60 off ramp EB	SB	TV
84	US-60 WB and EB on ramps	SR-101 off ramp NB	NB	TV
85	SR-101 on ramp NB	US-60 off ramp EB	EB	TV
86	US-60 on ramp EB	SR-101 off ramp NB	EB	TV
87	SR-101 on ramp NB	US-60 off ramp WB	WB	TV
88	SR-101 on ramp SB	US-60 off ramp WB	WB	TV
89	US-60 on ramp WB	SR-101 off ramp NB	WB	TV
90	McClintock Dr.	US-60 off ramp WB	WB	TV
91	I-10 on ramp WB	I-17 off ramp SB	WB	TV
92	I-17 on ramp NB	I-10 off ramp EB	EB	TV
93	I-10 EB and WB on ramps	I-17 off ramp SB	SB	TV
94	I-10 off ramps	I-17 on ramps NB	NB	TV
95	I-17 on ramp SB	I-10 off ramp EB	SB	TV
96	19 th Ave.	I-17 off ramp NB	NB	TV
97	I-17 on ramp SB	19 th Ave.	SB	TV
98	I-17 on ramp SB	I-10 off ramps	SB	TV
99	I-10 on ramps	I-17 off ramp NB	NB	TV
100	I-17 on ramps	I-10 off ramp WB	WB	TV
101	I-10 WB HOV	SR-202 WB HOV	WB	TV
102	SR-202 EB HOV	I-10 EB HOV	EB	TV
103	I-10 on ramp SB	SR-51 SB	SB	TV

104	SR-51 and SR-202 on ramps	I-10 off ramp NB	NB	TV
105	SR-202 on ramp EB	SR-51 and I-10 off ramps	EB	TV
106	SR-202 EB	I-10 off ramp EB	EB	TV
107	SR-51 on ramp NB	SR-202 off ramp WB	WB	TV
108	SR-51 on ramp NB	SR-202 and I-10 off ramps	NB	TV
109	SR-51 NB	I-10 off ramp NB	NB	TV
110	I-10 on ramp WB	SR-202 off ramp WB	WB	TV
111	I-10 on ramp WB	SR-51 off ramp SB	WB	TV
112	SR-101 on ramp SB	SR-202 off ramps	SB	TV
113	SR-202 on ramps	SR-101 off ramp NB	NB	TV
114	SR-101 NB	8 th St.	NB	TV
115	8 th St.	SR-101 SB	SB	TV
116	SR-101 on ramps	SR-202 off ramp EB	EB	TV
117	SR-202 on ramp EB	SR-101 off ramps	EB	TV
118	SR-101 on ramps	SR-202 off ramp WB	WB	TV
119	SR-101 on ramp NB	SR-202 off ramps	NB	TV
120	SR-202 on ramps	SR-101 off ramp SB	SB	TV
121	SR-202 on ramp WB	SR-143 off ramps	WB	TV
122	SR-143 on ramps	SR-202 off ramp EB	EB	TV
123	SR-143 on ramp SB	SR-202 off ramp EB	SB	TV
124	SR-202 on ramp WB	SR-143 off ramp NB	NB	TV
125	SR-143 on ramp NB	SR-202 off ramp EB	NB	TV
126	SR-202 on ramp WB	SR-143 off ramp SB	SB	TV
127	I-17 on ramp SB	SR-101 off ramps	SB	TV
128	SR-101 on ramps	I-17 off ramp NB	NB	TV
129	I-17 on ramps	SR-101 off ramp EB	EB	TV
130	SR-101 off ramp WB	I-17 off ramps	WB	TV
131	SR-101 on ramps	I-17 off ramp SB	SB	TV
132	I-17 on ramp NB	SR-101 off ramps	NB	TV
133	I-17 on ramps	SR-101 off ramp WB	WB	TV
134	SR-101 on ramp EB	I-17 off ramps	EB	TV
135	SR-101 on ramp NB	I-10 off ramp EB	EB	TV
136	I-10 on ramp WB	SR-101 off ramp SB	WB	TV
137	SR-101 on ramp NB	I-10 off ramp WB	WB	TV
138	I-10 on ramp EB	SR-101 off ramp SB	EB	TV

Table 7: ADOT Loop Mainline Site Locations

Site #	Fwy	Between	Direction	Data
145	SR-101	Olive Ave. and Northern Ave.	Both	TV by Lane
146	SR-101	Bell Rd. and Thunderbird Rd.	Both	TV by Lane
147	SR-101	67 th Ave. and 75 th Ave.	Both	TV by Lane
148	SR-101	35 th Ave. and 51 st Ave.	Both	TV by Lane
149	I-17	Cactus Rd. and Peoria Ave.	Both	TV by Lane
150	I-17	Carefree Hwy and Happy Valley Rd.	Both	TV by Lane
151	I-10	Warner Rd. and Ray Rd.	Both	TV by Lane
152	I-10	Guadalupe Rd. and Baseline Rd.	Both	TV
153	SR-101	Warner Rd. and Ray Rd.	Both	TV by Lane
154	US-60	SR-101 and McClintock Rd.	Both	TV by Lane
155	US-60	Dobson Rd. and SR-101	Both	TV by Lane
156	US-60	Power Rd. and Sossaman Rd.	Both	TV by Lane
157	US-60	Ellsworth Rd. and Crismon Rd.	Both	TV by Lane
158	US-60	Ironwood Dr. and Signal Butte Rd.	Both	TV by Lane
159	SR-101	McDowell Rd. and McKellips Rd.	Both	TV by Lane
160	SR-101	Chaparral Rd. and Indian School Rd.	Both	TV by Lane
161	SR-101	Indian Bend Rd. and McDonald Dr.	SB	TV by Lane

Appendix 1: Bottleneck Evaluation Matrix

		Traffic Volume	Traffic Density	Delay	Crashes	Duration of Congestion	Freeway-to-Freeway Back-Ups	Off-Ramp Back-Up into Mainline Lanes
Morning Peak	Location							
I-10	103 rd Ave to SR-51 TI-EB							
	Chandler Blvd to 40 th St-NB							
	SR-51 TI to 103 rd Ave-WB							
I-17	Happy Valley Rd to Union Hills Dr-SB							
	Glendale Ave to Van Buren St-SB							
SR-51	Northern Ave to I-10 TI-WB							
US-60	Stapley Dr to I-10 TI-WB							
SR-101	Indian School Rd to I-10 TI-SB							
	Thomas Rd to SR-202 TI-SB							
	Guadalupe Rd to McKellips Rd-NB							
SR-202	Dobson Rd to I-10 TI-WB							
Afternoon Peak								
I-10								
	SR-51 TI to 103 rd Ave-WB							
	40 th St to Elliot Rd-SB							
I-17	27 th Ave to SR-51 TI-EB							
US-60	Bell Rd to Deer Valley Rd-NB							
SR-101	I-10 TI to Country Club Rd-SB							
SR-143	SR-202 TI to Guadalupe Rd-SB							
SR-202	SR-202 TI to I-10 TI-SB							
	SR-51 TI to Alma School Rd-EB							